WHAT IS CLAIMED IS :

1. A method of dynamically assembling an array of particles at an interface between an electrode and an electrolyte solution, the method comprising the following steps:

providing an electrode, an electrolyte solution and an interface therebetween;

providing a plurality of particles located in said electrolyte solution;

patterning said electrode to include at least one area of modified electrochemical properties; and

generating an electric field at said interface to cause the assembly of an array of particles in accordance with the electrochemical properties of said electrode.

2. The method of claim 1, further comprising the step of maintaining said particles in accordance with said assembly by either maintaining said electric field, chemically linking said particles, or confining said particles.

3. The method of claim 1, further comprising the step of removing said electric field to thereby cause the disassembly of said array of particles.

4. An array of particles formed by the method of dynamically assembling the array of particles at an interface between an electrode and an electrolyte solution, the method comprising the following steps:

providing an electrode, an electrolyte solution and an interface therebetween;

providing a plurality of particles located in said electrolyte solution;

patterning said electrode to include at least one area of modified electrochemical properties; and

generating an electric field at an interface between said electrode and said electrolyte solution by applying a voltage between said electrode in a first plane and a second electrode positioned in a second plane different from said first electrode

5. The array of claim 4, wherein said particle array is compositionally random and said particles are chemically encoded to include chemically or physically distinguishable characteristics.

6. An array of particles comprising:

a substrate having at least one surface;

a plurality of particles, said particles being arranged on said substrate in substantially one layer and in a substantially non-random arrangement;

said plurality of particles comprising a plurality of types of particles, said types being distinguishable by chemical or physical characteristics.

7. A method of forming a spatially encoded array including multiple types of particles suspended at an interface between an electrode and an electrolyte solution, said method comprising the following steps:

providing an electrode and an electrolyte solution;

providing multiple types of particles, each type having chemically or physically distinguishable particle characteristics and storing said particles in one or more reservoirs, each reservoir containing one or more types of particles suspended in said electrolyte solution;

depositing one or more droplets from said one or more reservoirs onto said electrode, said electrode having a hydrophobic surface, thereby creating one or more corresponding fluidic compartments, each said droplet originating from one of said reservoirs and remaining confined to a corresponding fluidic compartment containing fluid from only a single reservoir and each said droplet containing at least one particle;

positioning a top electrode above said droplets so as to simultaneously contact each said droplet;

generating an electric field between said top electrode and said one or more droplets; and

using said electric field to form a particle array in each of said one or more compartments, each said particle array remaining spatially confined to one of said one or more

droplets.

8. The method of claim 7, further comprising the step of maintaining said particles in accordance with said assembly by either maintaining said electric field, chemically linking said particles, or confining said particles.

9. The method of claim 7, further comprising the step of removing said electric field to thereby cause the disassembly of said array of particles.

10. An array of particles formed by the method of forming a spatially encoded array including multiple types of particles suspended at an interface between an electrode and an electrolyte solution, said method comprising the following steps:

providing an electrode and an electrolyte solution;

providing multiple types of particles, each type having chemically or physically distinguishable particle characteristics and storing said particles in one or more reservoirs, each reservoir containing one or more types of particles suspended in said electrolyte solution;

depositing one or more droplets from said one or more reservoirs onto said electrode, said electrode having a hydrophobic surface, thereby creating one or more corresponding fluidic compartments, each said droplet originating from one of said reservoirs and remaining confined to a corresponding fluidic compartment containing fluid from only a single reservoir and each said droplet containing at least one particle;

positioning a top electrode above said droplets so as to simultaneously contact each said droplet;

generating an electric field between said top electrode and said one or more droplets; and

using said electric field to form a particle array in each of said one or more compartments, each said particle array remaining spatially confined to one of said one or more droplets.

11. An apparatus for dynamically assembling an array of particles at an interface between an electrode and an electrolyte solution, said apparatus comprising:

an electrode, an electrolyte solution and an interface therebetween;

a plurality of particles located in said electrolyte solution;

said electrode being patterned to include at least one area of modified electrochemical properties;

an electric field generator which generates an electric field at said interface to cause the assembly of an array of particles in accordance with the electrochemical properties of said electrode.

12. The apparatus of claim 11, further comprising:

an illumination source which illuminates said electrode with a predetermined light pattern to thereby cause the assembly of said array of particles.

13. The apparatus of claim 11, further comprising:

an electric field removal unit which removes said electric field to cause the disassembly of said array of particles.

14. An apparatus for forming a spatially encoded array including multiple types of particles suspended at an interface between an electrode and an electrolyte solution, said apparatus comprising:

an electrode and an electrolyte solution;

multiple types of particles, each type having chemically or physically distinguishable particle characteristics and storing said particles in one or more reservoirs, each reservoir containing one or more types of particles suspended in said electrolyte solution;

a deposition unit for depositing one or more droplets from said one or more reservoirs onto said electrode, said electrode having a hydrophobic surface, thereby creating one or more corresponding fluidic compartments, each said droplet originating from one of said reservoirs and remaining confined to a corresponding fluidic compartment containing fluid from

only a single reservoir and each said droplet containing at least one particle;

a top electrode positioned above said droplets so as to simultaneously contact each said droplet;

an electric field generator for generating an electric field between said top electrode and said one or more droplets; and

said electric field forming a particle array in each of said one or more compartments, each said particle array remaining spatially confined to one of said one or more droplets.